TABLE 1 DATA QUALITY OBJECTIVES

STEP 1: State the Problem

Waste from historical refining activities has migrated in environmental media. To be discussed if the areas (Wilcox Process Area, Lorraine Process Area, East Tank Farm, North Tank Farm, and Loading Dock) shall be addressed in separate data quality objective (DQO) tables to reflect the appropriate source of contamination, means of release to the environment, contaminant of potential concern (COPCs), and receptors according to the conceptual site model (CSM) diagram.
Industrial/manufacturing processes at the Site have resulted in a release of contaminants to media creating primary sources of contamination. The problem for each area will be defined based on the type of the sources of contamination and the COPCs, the impacted media, and the potential for risk to human and ecological receptors.

Land use: Residential use across the site, 0-2 ft bgs; short term exposure of construction workers to contaminated soil 0-10 ft bgs

CSMs: Comprehensive CSMs have been prepared for human health and ecological risk; discussion of how they may be different from area to area.

COPCs: The current COPC list consists of the following: volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), semivolatile organic compounds (SVOCs), target analyte list (TAL) metals, mercury, hexavalent chromium, cyanide, and dioxins/furans.

Residential sampling June 2015:

1. Areas in the proximity of the five on site and 4 off site residences have been sampled by collecting 5-point composites from each cell of grids varying in size from 4 to 8 cells.
2. Samples were collected from 0-2 inches bgs, 2-6 inches bgs, 0.6-1 ft bgs, and 1-2 ft bgs.
3. Samples were analyzed for VOCs, SVOCs, PAHs, pesticides, polychlorinated biphenyls, and TAL metals.

A ROST laser-induced fluorescence (LIF) survey was performed in December 2015. The study area covered a significant portion of the site and focused on areas where the contamination was most likely to have occurred.

Based on the data downloaded from Scribe, sampling performed in December 2015 in conjunction with ROST LIF included the following:

- 23 soil samples analyzed for SVOCs, VOCs, and total metals; none of these samples were collected from the 0-2 ft bgs interval for residential exposure
- 1 sand sample analyzed for SVOCs, VOCs, and total metals (surface sample)
- 1 pond discharge sample analyzed for SVOCs, VOCs, and total and dissolved metals
- 6 samples coded as “ground water” analyzed for SVOCs, VOCs, and total and dissolved metals; no depth specified

X-Ray fluorescence (XRF): Approx. 170 samples were analyzed for over 20 metals by XRF; we have not located any split samples for analytical laboratory analysis so that a correlation can be made with the XRF data; assumed that the depth of the top of the samples is listed as “sublocation,” no interval is specified

STEP 2: Identify the Goals of the Study

The following goals will be established for each area:

1. Assess the lateral and vertical extent of contamination in the media affected within each area: surface/subsurface soil, groundwater, sediment, and surface water; in the process, gather additional information on the transport mechanisms that are responsible for migration of contamination
2. Assess the areas and volumes of contaminated media that exceed applicable standards/risk-based levels
3. Determine if there is a potential for contamination to migrate from subsurface soil to ground water
4. Assess if there is a potential for valor intrusion
5. Understand the subsurface (geology and hydrogeology) to assess the interaction between ground water and surface water
6. Determine if any of the current and future human and ecological receptors will be at risk due to the contamination at the site

STEP 3: Identify Information Inputs

Information inputs are discussed based on the exposure media identified in the CSM as having potential exposure routes to the receptors.

Surface soil (0-2 ft bgs) for residential use scenario: evaluate current data from June 2015; additional sample collection may be necessary based on the data currently available and the approach that will be implemented for evaluation of risk to residents at residences to be built in the future.

Subsurface soil (<10 ft bgs) for construction worker scenario: evaluate ROST LIF data in conjunction with current analytical data to determine usability and making future decisions on data gaps and COPCs.

All soil samples (even >10 ft bgs) will be used to determine if there is a potential for migration of the contamination to ground water.

Soil data currently available:

Evaluate the June 2015 residential sampling:

1. Are the composite data usable for risk evaluation?
2. Are all COPCs accounted for?
3. Do the grids cover the appropriate areas around the residences?
4. Can data from subsurface characterization of the most contaminated areas be utilized to guide the need for additional residential sampling?

Evaluate the December 2015 ROST LIF data:

1. Soil samples were collected at locations/depth of highest ROST LIF. Is the COPC suite for which the soil samples analyzed sufficient to characterize nature and extent of contamination?
2. Compare ROST LIF data to analytical data from soil samples to assess if they are reliable for delineating laterally and vertically the extent of contamination.
3. If ROST LIF data are useable, assess gaps in the data and determine where additional samples have to be collected to complete delineation.

Evaluate the December 2015 XRF data:

1. Determine how the XRF data correlate to analytical results of split samples. Analytical results have not been located. If data correlates, correct the XRF data, if necessary.
2. Assess if the data currently available are adequate to define the extent of metals in surface soil and identify data gaps.

Surface water and sediment: See proposed sampling strategy provided separately; discuss COPCs based on currently available soil data.

Ground water: The 3 samples collected were likely perched water; assess if these data should be compared to any ground water standards or not. In a phased approach, ground water could be investigated after the COPC list has been refined based on soil sampling data.

Air:

1. The church and parsonage on Lorraine Process Area and the residence on Wilcox Process Area will be assessed for vapor intrusion by collecting indoor air and crawl space air or subslab soil gas samples, depending on building construction. Samples will also be collected outdoors to determine ambient conditions. Samples will be analyzed for VOCs and PAHs.
2. Soil gas samples will be collected from the vicinity of three residences on East Tank Farm and one residence on North Tank Farm. Samples will be analyzed for VOCs and PAHs.

Biota: In a phased approach, biota samples would be collected from the areas of the highest contamination to be representative of the worst case scenario. Additional data would have to be collected on site to determine what biota samples are necessary (plant, fish, mammals, etc.) based on the actual local practices.

Waste: Discrete samples will be collected from areas of waste accumulation and will be analyzed by Toxicity Characteristic Leaching Procedure.

Regarding action levels for environmental media, the following will be utilized:

1. Federal standards
2. EPA screening levels (residential and industrial scenarios as well as the potential of migration to ground water); discuss if the regional screening levels are for 10^{-6} or $10^{-5}$for carcinogens and a hazard index of 0.1 or 1.0.
3. State-specific standards, if applicable

Waste characterization and determination for disposal: waste samples will be analyzed using Toxicity Characteristic Leaching Procedure and other waste-appropriate analytes. Determine the extent of the waste distribution (lateral and vertical) to determine volumes to be addressed. Analytical results will be compared to the values in 40 Code of Federal Regulations [CFR] Part 261Table 1 (Maximum Concentration of Contaminants for the Toxicity Characteristic). Based on analytical results of samples, determine if waste removal and disposition is required.

STEP 4: Define the Boundaries of the Study

For each area and medium, the following will be defined:

1. Horizontal extent of contamination for each target medium and the area-specific COPCs.
2. Lateral extent contamination for each target medium and the area-specific COPCs.
3. Vertical extent of contamination for each target medium and the area-specific COPCs.
4. Temporal boundary.

STEP 5: Develop the Analytic Approach

The analytic approach will be defined for each area and environmental medium; in addition, waste present at the site will be characterized.

1. Surface/subsurface soil: Discrete and, if appropriate, incremental sampling (IS) will be utilized for soil characterization. Background conditions will be assessed.
2. Surface water/sediment: On-site ponds and streams and off-site streams will be sampled to determine what contamination has migrated via surface run-off or seepage. Surface water and sediment samples will be collected based on receptors (human and ecological) that may be affected and means of transport of the contamination to the respective locations. Upstream conditions will be assessed.
3. Groundwater: Hydrogeology of the area will be assessed and the potential of migration to groundwater evaluated. Groundwater samples will be collected at locations indicated by the

hydrogeology. Upgradient conditions will be assessed.

4. Air: Select areas where residents live will be evaluated for vapor intrusion.
5. Waste: Areas where waste deposition is observed will be sampled.
6. For metals, analytical data in soil will be compared to local/regional background values.
7. For groundwater, upgradient data will be used to assess the origin of the contamination detected on site.
8. For surface water and sediment, upstream data will be utilized to assess the origin of any contamination detected downstream.
9. Biota samples will be collected, as deemed necessary by the CSM and contamination present in media on the exposure path to the receptor. Most likely, biota samples will be collected from areas where the exposure media exhibit the highest contamination.

STEP 6: Specify Performance or Acceptance Criteria

Qualitative and quantitative data will be collected.

1. Test methods will be selected based such that the reporting limits will be adequate with respect to making the necessary comparison to the action levels/standards.
2. QC samples will be collected during this phase of sampling to evaluate sampling techniques and consistency.

STEP 7: Develop the Detailed Plan for Obtaining Data

To be discussed for each of the areas.